

Application No. 10/814,768
Response dated October 4, 2007
to Office Action mailed June 4, 2007

REMARKS

The Examiner has rejected claims 1, 12, 13, 15, 16, 23-29 and 31 under 35 U.S.C. § 102(b) as being anticipated by Fukuda et al. U.S. Patent Application Publication No. 2001/0037769. Claim 30 is rejected under § 103(a) as being unpatentable over Fukuda in view of Ravi U.S. Patent No. 5,952,060. Claims 7, 8 and 11 are rejected under § 103(a) as being unpatentable over Fukuda in view of Ohashi et al. U.S. Patent Application Publication No. 2003/0064225. Claims 9 and 10 are rejected under § 103(a) as being unpatentable over Fukuda in view of Ohashi, and further in view of Ravi. Claims 14-16, 18 and 35 are rejected under § 103(a) as being unpatentable over Fukuda in view of Vaartstra et al. U.S. Patent No. 6,197,628, and further in view of Nakajima U.S. Patent No. 6,452,775. Claim 32 is rejected under § 103(a) as being unpatentable over Fukuda in view of Vaartstra and Nakajima, and further in view of Norman et al. U.S. Patent No. 6,869,876. Claim 34 is rejected under § 103(a) as being unpatentable over Fukuda in view of Vaartstra and Nakajima, further in view of Norman, and further in view of Ravi.

Applicants hereby affirm the election of Species A, claims 7-11, 32 and 34 made on April 20, 2007.

The Examiner has objected to the drawings filed March 31, 2004 because two figures are marked FIG. 6B. Submitted herewith is the replacement drawing sheet including the correction of changing the figure incorrectly marked as FIG. 6B to read FIG. 6C.

Applicants have amended claim 1 by adding the elements of claim 7, such that amended claim 1 is essentially equivalent to claim 7 rewritten in independent form. Accordingly, Applicants have canceled claim 7 and have amended claim 8 and claim 11 to properly depend from claim 1. Applicants have also amended claim 35 to correct for a lack of antecedent basis with the non-metal-containing gas. The following remarks are respectfully submitted.

First, Fukuda discloses “the surface layer 20 has an electrical resistivity lower than that of the base material of the susceptor 3.” (see ¶ [0035]) The base material of the susceptor is disclosed as being “AlN, Al₂O₃, or the like.” (see ¶ [0030]) In contrast, Ohashi discloses a diamond coating on a basal material also of AlN, among others. (see ¶ [0033] of Ohashi) However, Ohashi notes that “diamond . . . has . . . high resistivity.” (see ¶ [0022]) And while Ohashi also notes that the diamond coating may have some conductivity greater than what diamond would be considered to have, Ohashi then states in ¶ [0169] that when the diamond film is exposed to NF₃ plasma (NF₃ plasma is commonly used to clean the chambers and other deposition equipment in semiconductor processing), the resistivity increases to $1 \times 10^{16} \Omega \text{ cm}$ or more. Consequently, the resistivity of the diamond film far exceeds the resistivity of the AlN basal material (Ohashi notes that the electrical resistivity of AlN is $1 \times 10^{10} \Omega \text{ cm}$) by approximately 6 *orders of magnitude*. That is, the electrical resistivity of the surface layer is not lower than that of the base material of the susceptor, as Fukuda requires. Thus, one skilled in the art would not be motivated to modify the surface layer having a lower electrical resistivity than the base material of the susceptor of Fukuda by forming a diamond film thereon. To do so would defeat what Fukuda was attempting to prevent. In other words, modification of Fukuda as suggested by the Examiner would render Fukuda inoperable for its intended purpose. MPEP § 2143.01 V.

In addition, Applicants contend that the diamond-coating of Ohashi was intended to be a long-lasting coating. This is evident by the corrosion-erosion testing data provided in Ohashi. In particular, Table 4 presents data indicating that the diamond film is resistant to plasmas commonly used to clean CVD chambers. It follows then that Ohashi intended the diamond film to protect the basal material from these types of cleaning gases, most likely to extend the life of the basal material. In contrast, Fukuda describes a coating designed for periodic removal, *i.e.*, one that is not resistant to cleaning gases. Accordingly, one skilled in the art would not be motivated to modify a removable/disposable coating of Fukuda with a long-lasting coating of Ohashi. The modification of Fukuda in the manner suggested by the Examiner

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would change the principle of operation of Fukuda. MPEP § 2143.01V.

For at least these reasons, one skilled in the art would not be motivated to modify the teachings of Ohashi with those in Fukuda. The Examiner has failed to establish a *prima facie* case of obviousness. Therefore, Applicants respectfully request withdrawal of the rejections of amended claim 1 (formerly claim 7) and claims 8 and 11.

The Examiner has rejected claims 9 and 10 under 35 U.S.C. § 103(a) as being unpatentable over Fukuda in view of Ohashi and in further view of Ravi. Claims 9 and 10 depend indirectly from amended claim 1. Applicants disagree with the rejection.

To establish a case of *prima facie* obviousness, there must be some motivation to combine the references. Applicants submit that one skilled in the art would not be motivated to modify Fukuda, with Ohashi and Ravi as the Examiner has suggested. The Examiner admits that Fukuda in view of Ohashi does not teach what Applicants have recited in claims 9 and 10. Ravi discloses multiple diamond or diamond-like layers to extend the lifetime of processing chamber components. (see col. 2, ll. 27-28) Therefore, in addition to the reasons as set forth above with respect to amended claim 1 and claims 8 and 9, Ravi does not cure the deficiency of Fukuda in view of Ohashi with respect to neither claim 9 nor claim 10. The modification of Fukuda in the manner suggested by the Examiner would render Fukuda inoperable for its intended purpose. MPEP § 2143.01 V. The Examiner has failed to establish a *prima facie* case of obviousness with respect to claims 9 and 10. Therefore, Applicants respectfully request withdrawal of the rejection as to these claims.

The Examiner has rejected claims 14, 15, 16, 18, and 35 under 35 U.S.C. § 103(a) over Fukuda in view of Vaartstra in further view of Nakajima. Claims 14, 15, and 16 depend directly from amended claim 1. Claim 18 depends from independent claim 35. The Applicants disagree with the rejection.

To establish a case of *prima facie* obviousness, there must be some motivation to combine the references. The Examiner admits that Fukuda does not describe using a metal-containing gas that comprises at least one metal-carbonyl gas and the non-metal-containing gas

comprises silane. The Examiner then looks to Vaartstra to cure this deficiency. However, Applicants contend that one skilled in the art would have no motivation to look to Vaartstra to modify Fukuda. Vaartstra describes a barrier for use in semiconductor devices, not to prevent contamination of the substrate by the adjacent supporting surface. The Examiner cites to col. 4, ll. 9-15 for the proposition that ruthenium silicide may be used for any application. However, “any application” refers to semiconductor device structures disclosed in Vaartstra. In particular, Vaartstra provides numerous examples of uses for its RuSi_x diffusion barrier, including “in the formation of storage cell capacitors and semiconductor devices. (col. 4, ll. 23-35) Vaartstra is silent as to barrier layers on the equipment within the deposition chamber for preventing contamination of the substrate. Furthermore, Vaartstra discloses a barrier for preventing, for example, “diffusion from a silicon containing surface” into adjacent semiconducting structures, not a barrier to prevent metal contamination of the silicon substrate from surrounding contact locations. In other words, Vaartstra does not describe a barrier for preventing contamination of silicon substrates with impurities or elements found within the deposition chamber.

The Examiner then suggests a motivation to modify Fukuda and Vaartstra by citing Nakajima. However, Nakajima does not provide a motivation to modify Fukuda with Vaartstra either. Please recall that Fukuda describes a susceptor having a surface layer for preventing the semiconductor substrate from electrostatically adhering to the susceptor. To prevent electrostatic adherence of the substrate to the susceptor, the surface layer is described as being of lower resistivity than the base material of the susceptor. (see ¶¶ [0020] and [0035] of Fukuda) Nakajima, on the other hand, describes an electrostatic chuck. The electrostatic chuck is coated with a high purity Al_2O_3 , SiO_2 , or SiN layer. (see col. 2, ll. 27-30). The high purity layer in Nakajima is disclosed as having a high resistivity, for example, greater than $10^{12} \Omega\text{cm}$ (col. 2, l. 34). Nakajima claims that the high purity resistivity layer *enhances* the adherence of the substrate to the electrostatic chuck, which is metallic. (see col. 2, ll. 19-48). In summary, Nakajima and Fukuda disclose devices having exactly opposite functions due to exactly opposite arrangement of electrical resistivity of the layers. Nakajima has a high purity layer with higher

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electrical resistivity than the base material (a metal) and Fukuda has a surface layer with a lower resistivity relative to the base material. Fukuda is designed to release substrates while Nakajima adheres substrates. Therefore, one skilled in the art would not modify the disclosures of Fukuda with Nakajima because modification of Fukuda in the manner suggested by the Examiner would render Fukuda inoperable for its intended purpose. MPEP § 2143.01. Consequently, the Examiner has failed to establish a *prima facie* case of obviousness with respect to claims 14, 15, and 16. Applicants respectfully request that the rejection of these claims be withdrawn.

The Examiner has rejected claims 35 and 18 under 35 U.S.C. § 103(a) as being unpatentable over Fukuda in view of Vaartstra in further view of Nakajima. Claim 35 is an independent claim and claim 18 depends from claim 35. Applicants disagree with the rejection. For at least the reasons recited above for claims 14-16, the Examiner has failed to establish a *prima facie* case of obviousness. Thus, Applicants respectfully request withdrawal of the rejection.

The Examiner has rejected claim 30 under 35 U.S.C. § 103(a) as being unpatentable over Fukuda in view of Ravi. Claim 30 depends from amended claim 1. Thus, the rejection is moot in light of the amendments. However, as previously stated with respect to the rejections of claims 9 and 10, Ravi discloses a diamond or diamond-like layer coating. One skilled in the art would not be motivated to modify Fukuda in light of Ravi because doing so would render the Fukuda inoperable for its intended purpose. MPEP §2143.01 V.

The Examiner has rejected claim 32 as being unpatentable over Fukuda, in view of Vaartstra and Nakajima, and in further view of Norman. Claim 32 is an independent claim. Applicants disagree with the rejection. Applicants submit that claim 32 is nonobvious for at least the same reasons as set forth above with respect to dependent claims 14, 15, and 16 and independent claim 35. Norman does not cure the deficiencies of Fukuda in view of Vaartstra and Nakajima. Moreover, Norman discloses, as the Examiner points out at col. 10, ll. 4-22, "a substrate surface" having "a barrier layer to which the metal halide is deposited thereupon." Accordingly, like Vaartstra, one skilled in the art would not look to Norman because, Norman is

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confined to semiconductor substrate structures, while being silent as to the substrate holder. The Examiner has failed to establish a *prima facie* case of obviousness with respect to claim 32. Applicants respectfully request withdrawal of the rejection.

The Examiner has rejected claim 34 as being unpatentable over Fukuda, in view of Vaartstra and Nakajima, further in view of Norman, and further in view of Ravi. Claim 34 depends from claim 32. Applicants disagree with the rejection.

In addition to the arguments above with respect to claim 32, Ravi does not cure the deficiencies in the plurality of references cited by the Examiner. Furthermore, one skilled in the art would not be motivated to modify Fukuda with the teachings of Ravi. Ravi discloses a diamond and diamond-like coatings. These coatings “are resistant to the reactants used in substrate processing systems, and thus extend the lifetime of processing chamber components”. (col. 2, l. 26-29). As previously stated with regard to the rejection of claims 7, 8, and 11, Ohashi discloses a diamond coating. Thus, like Ohashi, the modification of Fukuda in the manner suggested by the Examiner would render Fukuda inoperable for its intended purpose. MPEP § 2143.01. Therefore, the Examiner fails to establish a *prima facie* case of obviousness with respect to claim 34. Applicants respectfully request withdrawal of the rejection.

In view of the foregoing amendments to the claims and remarks given herein, Applicants respectfully believe this case is in condition for allowance and respectfully request allowance of the pending claims. If the Examiner believes any detailed language of the claims requires further discussion, the Examiner is respectfully asked to telephone the undersigned attorney so that the matter may be promptly resolved. The Examiner's prompt attention to this matter is appreciated.

Applicants are of the opinion that a one-month extension of time is due with this Amendment. Payment of all charges due for this filing is made on the attached Electronic Fee Sheet. If any additional charges or credits are necessary to complete this communication, please apply them to Deposit Account No. 23-3000.

